# On the Plastic Defromation of Some Ionic Crystals

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The apparatus has been modified a little, and now the argentometric titration of dilute chloride solution by this apparatus will be reported.

In the modified apparatus, the plate current (Ip) can be measured and regulated by the newly equipped milliammeter and the variable condensor. So the titration is always started after the Ip is so regulated as to show its minimum value.

Experiment: 10 ml of 0.001 N-sodium chloride standard solution was titrated with 0.001 N-silver nitrate solution (saturated with silver chloride), and those chlorides in drinking water, well-water, sea water and the chloride in air were also determined by the same silver nitrate solution. The results were as follows:

| Sample taken | 0.001N-$AgNO_3$ used | Cl found |
|---|---|---|
| NaCl<br>(Cl=354.6γ) | 10.0, 10.0<br>10.1 | 354.6γ 354.6γ<br>358.1γ |
| drink water (Kyoto) 25ml | 4.60ml 4.60ml<br>4.65ml | 6.53mg/L 6.53mg/L<br>6.60mg/L |
| certain well water 10ml | 5.40ml 5.40ml<br>5.20ml | 19.17mg/L 6.53mg/L<br>18.46mg/L |
| air (Amagasaki)<br>1m³ (dissolved in 50ml water) | 5.20ml 5.20ml<br>5.00ml | 184.6γ/m³ 184.6γ/m³<br>177.5γ/m³ |
| Sea water (X1000) 10ml | 5.30ml 5.35ml<br>5.35ml | 19.81g/L 19.99g/L<br>18.99g/L |

Conclusion: Generally speaking, solution containing γ-Cl/ml ($10^{-4}$ N) can be titrated with the accuracy of ±2% or better.

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## 13. On the Plastic Defromation of Some Ionic Crystals

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Many studies have been reported on the plastic deformation of metals, but very few in the case of ionic crystals. Studies are now carried on AgF, AgCl, AgBr, AgJ, CuBr, cast in preheated porcelain after melting. Among these samples, AgCl and AgBr can be rolled at room temperature, but the rests cannot, because of their brittleness. On the occasion of rolling, AgCl and AgBr bring about the so-called Tincry and can be easily reduced to 3μ from 5 mm in thickness.

The effects of reduction by rolling on hardness were measured by Shore's hardness tester and results were as follow: as for AgCl hardness elevated up to 16-20 at 70% reduction from the original one 11.8, and as the reduction proceeded hardness dropped gradually and tended to decrease to 13; and effects of AgBr was

alike to AgCl and the peak of hardness alteration by annealing, abnormal hardening was measured, at 100°C and 200°C after 15 minutes from the start of annealing but not measured at 300°C. Also as for AgBr such hardening existed after 15 min. at 100°C.

Applying X-ray Laue method, photographs showed that AgCl and AgBr foils had fibre structure whose axis <110> was parallel to the direction of rolling and recrystallization phenomenon existed in such ionic crystals, and that such an phenomenon begins at 100°C for 120 min. for AgCl and at room temperature for 3 days for AgBr. On the basis of the fact that three samples annealed, at 100°C. 240 min., 125°C. 30 min., 150°C. 3 min., respectively, resembled to each other with respect to the distribution of Laue spots by recrystallization, which are of the same order, and having an equal residual fiber structure, the activation energy of recrystallization was calculated to be 27500 col/mol.

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## 14. Influence of Slag, especially of $Al_2O_3$ and $TiO_2$ in Slag upon the Structure and Mechanical Properties of Cast Iron. (VI)

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(Sawamura Laboratory)

The gray cast iron was melted under the slag of $SiO_2$-CaO-$Al_2O_3$-$TiO_2$ system ($TiO_2$: 0–12%) at 1400°C., and the sample cooled in air with carbon crucible. (This Bulletin, **23**, Dec., (1950)).

$CaO/SiO_2$ ratio of the used slags was 0.5, 1 and 1.5 respectively, the contents of $TiO_2$ in each slag being from 0 to 12%.

(1) The titanium content in gray cast iron has increased in accordance with the increase of titanium oxide in the slag; the maximum percent in our research reached about 0.24% titanium.

(2) Nitrogen contained in gray cast iron showed no remarkable change by the increase of the above titanium.

(3) The flaky graphite carbon of original pig iron were found to become finer in our experiments.

We found that the cast iron of a fine eutectic graphite carbon structure, completely and uniformly homogeneous, was usually obtainable when the common pig iron was melted under the slag of $SiO_2$-CaO-$Al_2O_3$-$TiO_2$ system ($TiO_2$: about 10%) and with the $CaO/SiO_2$ ratio 1.5 at the experimental condition already described.

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